Logo Philosophy and Implementation

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The Computer in Costa Rica: A New Door to Educational and Social Opportunities

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She is particularly interested in the democratic uses of new technologies, especially in the use of computer technology for the development of talent, creativity and cognitive skills. Ms. Fonseca is the author of the book *Computers in Costa Rican Public Schools*, and of many articles in the areas of education, technology and socio-economic development. She has also published on aesthetic and literary topics.

George Bernard Shaw, the great English dramatist and social critic, is credited with having said that at the age of five he was forced to abandon his education in order to attend school. Shaw's insightful statement throws light on the difference between learning and schooling — a distinction that has received significant attention in recent years. To most children in the developing world, school offers little beyond basic instruction. In the anxious race to instill basic literacy and job-related skills, teachers and institutions have frequently failed to both adequately teach those skills and to respond to children's interests and cognitive development. Like Bernard Shaw, many children would no doubt rather learn from more direct and vital sources.

Furthermore, in a world progressively subject to technological change, these children have had little, if any, contact with technology. To children in the developing world and in deprived areas of more developed societies, technology is a distant symbol of a future that they can only observe slipping through a paradoxically technological window — that of the television screen.

From Hopes to Opportunities

Computers, on the other hand, open up a new dimension; they offer the means to turn elusive hopes into concrete opportunities. In the words of a Costa Rican teacher: "Television is a window that lets you look into the future. Through it, we can get glimpses of what a future world for us might be like. But the computer opens a door through which we can enter that future."

Like this teacher, many of us are convinced of the computer's potential as a door to development, especially for young people in deprived sectors of society. This is particularly the case when the computer is seen not only as a technological object, a symbol of progress, but as part of an emerging culture of human transformation. The cost effectiveness of computers in schools must be seen not only in terms of their use as effective teaching tools but also within the context of the more complex and far-reaching issues of human and national development. According to Seymour Papert, the real task of the educational community is to reformulate education itself while exploiting the computer's potential in the learning process (1987).

Computers and Educational Change: The Case of Costa Rica

Although the computer is still generally perceived as a mathematical and word processing machine, it has increasingly been used to transform the traditional school environment and to accomplish the higher goal of more humanized forms of development. One such instance has been an initiative of Costa Rica[1], which was launched as an act of national assertion, as an investment in the talent of its teachers and young people. The way in which computer technology was introduced to Costa Rican schools exemplifies what a developing nation can accomplish given a sustained commitment to its vision of the future.

Established in 1988, the Costa Rican Computers in Elementary Education Program was established to prepare a new generation of children and teachers for the challenges of the future. From the beginning, its main emphasis has been on the development of creativity, thinking skills and problem-solving abilities — long-term benefits that are expected to impact upon the country's socio-economic and technological development.

Equity in access to technology and more qualitative forms of education have been central considerations in the program design. Most projects that invest in educational technology in the developing world provide computers to high-school students to develop job-related skills. The

1 Costa Rica is a small Central American nation with a population of 3.5 million inhabitants and a per capita income of US $2,721 (1997) .

Costa Rican program broke away from the international standard model by focusing on very young children first, and for cognitive rather than computer literacy or computer-assisted instruction purposes. The program also broke new ground by giving priority to underprivileged rural and urban school populations.

Organized as a joint effort of the Ministry of Public Education and the Omar Dengo Foundation (ODF), the program has relied on countless individual, community, institutional and government resources and efforts. Initially, it reached over 140,000 pre-school and elementary school children a year — i.e., 30 percent of the country's total elementary school population. Computer labs were originally installed in 158 rural and urban schools throughout Costa Rica. In its first decade, the program provided services to over a million children, teachers and adults in all regions of the country — a significant accomplishment for a developing nation with a population of 3.5 million.

In 1998 the program went into its second phase, enabling it to reach approximately 225,000 children annually — i.e., one out of every two school children in the country. Participating schools are granted a laboratory with 20 multimedia computers organized in a local network, as well as a scanner, a printer, and access to the Internet. Computer labs are equipped with MicroWorlds, the basic educational software used in the program. Schools also have access to Microsoft Windows and Office, as well as the Encarta Encyclopedia and Atlas. These programs are used within the educational setting as well as for community-related activities. The number of computers assigned to each school is based on the number of students per class, not the size of the school. Students work at each computer in pairs, thus stimulating team work and collaborative learning.

The ODF also provides students and teachers with a telecommunications infrastructure and related support services, which promote learning and exchange activities. For over five years many students have been able to use e-mail and to create and publish an electronic magazine, which has a virtual editorial committee organized by children in different regions of the country. The international telecommunications activities have also been very enriching. They have provided new cultural experiences and generated bonds of friendship and solidarity.

As of 1998, with the introduction of the new computers and telecommunications platform, students and teachers can develop and publish their own web materials. Initially, students will use the computer lab's Intranet to share their projects. They also have access to e-mail and web services through both the Internet and the program's Extranet. On-line and virtual learning experiences for both students and teachers are being developed. Networking has always been seen as an exploration and problem-solving tool to enable students and teachers to transcend geographical and cultural limitations, which include the lack of libraries and other educational resources.

Since the program has a strong educational focus, the foundation also organizes intensive training and follow-up on how to use the computers and networking capabilities within a personally and educationally meaningful environment. At present, the ODF annually trains 7,500 lab tutors, program advisors, teachers, principals and educational authorities. During weekends, after-school hours, and vacation periods, the foundation also organizes courses directed to different members of the community. These courses help train individuals, workers and community groups to use productivity tools, as well as computer and Internet applications.

As of 1998, multimedia computers are also being installed in 70 small multigrade schools located in rural areas. This new dimension of the program involves research development in the context of educational uses of computers in

the classroom. The Ministry of Public Education has also created a Computers in Education Program for the secondary level. Through it, computers, software, training, and maintenance have been made available to almost all high schools in the country. The coordination of elementary and high-school programs generates new opportunities for students and ensures continuity of the efforts initiated with the younger children.

Pedagogical Focus and Social Context

The Costa Rican Computers in Education Program was established to bring about change both in children and teachers, to promote interest in learning, and to develop technological fluency in schools and communities. Logo was chosen as a learning and exploration environment to stimulate creativity, cognitive development, and collaborative work. In 1998, LogoWriter, the initial program used, was replaced by MicroWorlds, a multimedia program consistent with the Logo philosophy and environment, which is used as a generic programming and educational tool. MicroWorlds[2] is the central software used, though other Microsoft productivity and reference programs are also used when relevant to educational objectives. Children's learning activities are project-based and curriculum-related. The development of computer literacy skills is seen as a valuable by-product of higher educational goals.

During the first decade, Seymour Papert and other members of the Learning and Epistemology Group of MIT's Media Lab have contributed to the program in the design of educational environments and teacher- training strategies. They have worked with ODF and Ministry of Education personnel. In order to provide a sound and practical understanding of the issues surrounding the use of computers in education while enhancing the learning process, the ODF has promoted the academic and professional development of its teacher-training, research, and development staff. Historically, the foundation has invested significantly in the permanent training of all teachers and staff. This effort has had the support of the Ministry of Education and the University of Costa Rica.

The teacher, not the technology, has been the central focus of concern. Even though more than thirteen different options were considered during the planning phase back in 1987, the one selected was the most intensively teacher-dependent.[3] This was so precisely because one of the main objectives of the program was to rekindle the teachers' interest in their own professional growth and to help them value their role as apprentices. It is interesting to note that when groups of young students have occasionally visited ODF's Training and Research Center, their greatest surprise has been to find teachers in the process of learning. As one kid put it: "Wow, I never knew teachers also have to study!"

Instead of bypassing the teacher through the use of technology, as has frequently been the case, the program chose to focus on teacher development by exploiting the potential of computers. For this purpose, a strong and systemic teacher-training and follow-up program was created (see Fonseca, 1993). The preparation of tutors who work as lab attendants has been conceived as a continuing education effort that transcends computer-related matters. Much time and effort have been devoted to aspects of educational philosophy and practice. Teacher development has been seen as a process that requires different types of pedagogical, motivational, and technical inputs at different times. This fundamental component has been the responsibility of a group of advisors — a well-prepared

2 In 1997, the Costa Rican Ministry of Education purchased a national license of MicroWorlds, thus making it possible for all students and teachers to have the software available in school, at home, and in other formal and informal learning and recreational environments.

3 For a detailed analysis of how the Program was created and of the central criteria for its success, see Clotilde Fonseca, *Computadoras en la Escuela Pública Costarricense: La Puesta en Marcha de una Decisión*. San José, Ediciones de la Fundación Omar Dengo, 1991.

and highly motivated permanent task force that is in charge of developing training materials and modules while providing on-site and, more recently, virtual or on-line support.

Every two years, a national Computers in Education Conference is organized by the ODF. The conference promotes the exchange of experiences while introducing participants to new ideas and initiatives of colleagues in other areas of the country. The conference and the different training programs are part of an effort to build a strong professional culture. In a new area such as educational computing, a different set of attitudes and behaviors is required for the new educational context. The program addresses the formation of this new culture through working not only with teachers, tutors and advisors, but with school principals, supervisors, and other educational authorities as well.

An important aspect related to teacher participation in the Costa Rican Computers in Education Program is the gender component. It is worthy of note that over 90 percent of the teachers working as tutors and 97 percent of advisors and program staff are women. Most of them had never had any prior experience with computer technology before joining the program. This is a telling fact. While it is true that in Costa Rica most teachers are women, the fact that mostly women have chosen to become computer tutors says much about the program's capacity to respond to different teachers' learning styles and sources of motivation. To most of these women, participating in the program has been an assertive act, which raised their self-esteem and their prestige within their local and professional communities. This undoubtedly creates non-traditional role models for the thousands of girls in the program.

Besides the different project-based and curriculum-related activities, other types of learning situations have become available for students and teachers. These provide additional opportunities for enrichment, including access to themes, materials, and experiences not normally present in the traditional school setting or in often deprived community or home environments. Like the program that encompasses them, these new educational opportunities attempt to relate learning to personal productivity and to help children develop an awareness of the potential contributions they can make to their own communities.

Perhaps the most important of these activities is the Children's Computers in Education Conference. Created in 1989, the Children's Conference gathers several hundred K-6 elementary school students in an environment that is both recreational and educational. Children work throughout the school year on different research and creative development projects. Each school selects two delegates to the conference, who present their work and that of other classmates. They also participate in activities ranging from new design, telecommunications, and robotics workshops to cultural and recreational experiences.

The Children's Conference contributes to students' intellectual development while strengthening their personality and sense of autonomy. Kids travel, speak before a group, and express their own ideas and feelings. The selection of children to represent their school and present work produced by other classmates allows them to experience new forms of individual and group responsibility.

Like the program that hosts it, the conference provides low-income rural and inner city children from a small developing country with a variety of learning and socializing opportunities that combine play and cognitive skills, curriculum and community life, art and technology, personal interest and national values. Quite frequently, conference projects have a spill-over effect. Typical is the case of a group of children from San Isidro del General who, after having presented a project on deforestation, went back to their own town to organize a panel on ecological issues. These children were able to bring together to a

discussion table, not only the local authorities, but also owners of wood farms, many of whom had been responsible for deforestation in the area.

As recent research indicates, participation in the Children's Conference has a strong impact on the children's self-esteem and perception of their own future. A contest held by the foundation in 1997 collected the anecdotes of former program students, many of whom are now in high school or pursuing university careers. These stories revealed that the conference strongly affected the children's perception of themselves and their ability to plan a successful future. Many of them related how their participation in the program was a starting point for change in their lives.

These findings are consistent with what research on the program itself has revealed throughout the years. One of the primary effects of the program has been an improvement in the children's and the teachers' self-esteem and future outlook — an impact that was not anticipated but is central to individual growth and the capacity to learn. The program has also enhanced children's creativity (according to a 1993 Ministry of Education study), fostered children's independence, and increased their motivation to attend school.

The Subversive Power of Computers

Allowing children and teachers to develop their own talent and potential lies at the core of the Costa Rican Computers in Education Program. This, of course, can be a highly political matter. As a Latin American journalist who visited the program once noted: "If children learn to think as these kids are doing, if they become autonomous and critical, they may question the system, and that is dangerously subversive."

Few people have understood as deeply as this journalist the potential for innovative uses of computers in education, particularly in the developing world. However, this inherent subversion is not the violent political activism to which many Latin American youngsters have been drawn for decades. It is rather the subversion of mental patterns that lie at the base of impoverishment and that keep human talent trapped for generations.

This fact was clearly understood by the principal of a poor rural school in Costa Rica, who chose to invest funds collected for a soccer field to prepare the facilities for a computer lab. "What these children really need, he noted, are soccer fields for the mind" (Fonseca, 1991, p. 54). This dynamic metaphor is right on target and highly consistent with the emphasis on the mind that characterizes most of the social and economic developments of the late 20th century. This is particularly the case in light of the work and power relations generated by the emerging information culture (Zuboff, 1988). Moreover, the skills and training that are demanded by current changes in industry increasingly call for symbolic analysts more than the routine producers that characterized the industrial age (Reich, 1992).

Computers cannot change certain human conditions; nor can they overcome certain limits. However, when placed within a context that is both humanistic and educationally enriching, they can help create change in schools and communities and in the lives of the children and teachers who inhabit them. Perhaps one of the more valuable contributions that the Computers in Elementary Education Program has made to the international community is showing that it is possible to obtain significant results from introducing new technological and educational opportunities to children and teachers from deprived communities.

The ten-year history of the Costa Rican program demonstrates that computers in schools and communities have a multifaceted potential to bring about changes, including unexpected ones. For this to happen, however, the

traditional linear view of change in education must be abandoned. To bring about systemic change in education, qualitatively new options and approaches must be sought. The energizing effect generated by the presence of computers in schools (*World Bank Report*, April 1998) must be used to improve the intellectual development and living conditions of people.

Some Reflections on Technology and Development

Within the wider scope of national development and after years of sustained effort and investment, Costa Rica has begun to see significant changes in the country's production, which has recently become highly technological. In 1987, when the ODF was created, the founders were convinced that investment in educational technology would have an impact on the country's socio-economic development. This was clearly reflected in the institution's constitutive documents. In 1992, many were still skeptical when some of us wrote that equitable access to the uses of technology to further educational goals could help launch a basically agricultural society towards a service-oriented information age society — i.e., new industries that are more productive and, hopefully, less taxing to the environment (Fonseca 1992).

Today the former skepticism has been overcome by new realities. Current trends point clearly in the direction initially envisioned to the point that Costa Rica is now referred to as the technological capital of Latin America.

Among the reasons cited for the selection of Costa Rica as investment site for the technology industry by such corporations as Acer, Intel, Microsoft, and Motorola were the presence of a national Computers in Education Program and the widespread use of computers. (After Canada and the U.S., Costa Rica is among the countries with the highest concentration of computers in the Western hemisphere — *Wall Street Journal Americas*, April 7, 1998.) All this indicates a certain level of education and technological fluency in the general Costa Rican population. Coincidentally, on March 18, 1998, exactly ten years after the first elementary school computer lab was inaugurated, Intel began the operation of its microchip production plant — its first in all of Latin America.

Optimistic Scenarios

Experienced and somewhat skeptical experts and professionals in the field may view Costa Rica as a best-case scenario of the use of computers in schools and communities in the developing world. However, as Peter Schwartz has warned, optimistic views of the future are often viewed as unrealistic, which is a negative notion from a business point of view (*The Art of Long View*, 1991).

However, if countries genuinely wish to initiate change in education, they must abandon the tyranny of a linear view of development, which does not allow for the sudden leaps that can bring about qualitative changes. If attempting to do so is unrealistic, then so be it. Social systems undergo transformations as a result of the dialectical tension between the real and the possible, between the down-to-earth everyday reality and the dream. It has been said that the only sin we cannot forgive politicians and policy makers is their inability to dream, to envision new options.

Investing in the Young

Why must we emphasize the politician's need to dream? Precisely because education has become a political matter. The need to invest in educating new generations is one of the central problems faced by governments and international organizations today. Education is no longer the sole concern of educators and parents, but is becoming a central issue to economists, manufacturers, and entrepreneurs. In a world increasingly preoccupied with economic globalization, issues of efficiency and productivity have

taken center stage, both in developed and developing countries.

But don't be misled by the economic reference implicit in the term "investment." A look at the etymology of the word is enlightening. "Investment" means empowering, granting control or authority, arraying the symbols of office or honor. To understand investments in educational technology strictly in terms of economic or quantitative returns is to overlook the higher social function of education. We must invest in the young, while investing in them the energizing power of the technological and cultural developments of their time.

Redefining Priorities

To do this, however, we must redefine our priorities. The main argument used to justify the lack of investment in educational projects, particularly when associated with technology, is cost. However, funding problems are not exclusively economic problems. Deep down, they are political problems, because they involve the definition of priorities. The art or science of governing an organization, a community, or a nation is that of making choices.

This can be explained more clearly by way of an example: An F5 is a third-rate combat airplane whose use has been widespread in some Central American countries. In 1990 the cost of its yearly maintenance was approximately $1.5 million. (Montoya, 1990). Costa Rica has invested less in the annual upkeep of its initial Computers in Education Program, to reach over 30 percent of elementary-school children throughout the country, than a neighboring country spent in the maintenance of *just one* of its fleet of 38 combat airplanes.

Even though funds allocated to military spending are always confidential and difficult to obtain, more recent figures based on data from specialized journals and sources can be even more illustrative. In 1996, the yearly military budget of a neighboring Central American country was 75 million dollars.[4] With that year's budget, it would have been possible to acquire 2,679 computer laboratories of 20 units each — a purchase that would have benefited over 3.5 million students or three times the elementary-school population of that country.

To provide an even more dramatic example, the cost of just one F16 airplane ranges from $20 to $25 million dollars.[5] This sum would make it possible to purchase computers for nearly one million students. A major South American country is in the process of negotiating the purchase of 24 F16 combat airplanes, including training and spare parts. This involves an investment of about one billion dollars, an amount that would allow that country to provide access to computers in schools to 17 times their current elementary and high-school populations.

The Construction of the Future

A brief look at the political and economic situation around the world reveals that a significant proportion of the planet's population will remain unaffected by the dawn of the new millennium, no matter how momentous the change may be to others. Under such conditions the twenty-first century will reach very few people, if by twenty-first century we mean space-age development, quality of life, and access to the technological and social benefits of the time.

Furthermore, the impact that technology will have on our lives depends on social, political and economic decisions, not on the potential of the technology itself. Political and ethical decisions carry more influence than technological

4 Source: Military Balance, 1996/1997. These figures are provided for the sake of illustration and comparison. For this reason, the author has chosen not to reveal the name of the country in question.

5 Source: Council for a Livable World Education Fund based in Washington, D. C.

ones, because, as is historically evident, technological developments have not necessarily benefited everyone. Progress, as Paul Kennedy has observed, "benefits those groups or nations that are able to take advantage of the newer methods of science, just as it damages others that are less prepared, technologically, culturally and politically, to respond to change" (1993, p. 15).

Most of our challenges still lie precisely in the process of widespread cultural appropriation of the technology. We cannot refrain from facing these realities. Issues of equity and solidarity must regain their proper place so that our future will be characterized by actions more in line with our democratic values and global consciousness. Investing in the human aspects of development is no longer an altruistic matter. It is a matter of economic, national, and international survival.

The Need for Vision and Direction

Allowing children and teachers to emerge from behind their mental parapets — the limited confines of their cognitive and cultural windows — is one of the major changes that education must bring about. Creating learning environments that allow children to appropriate the world of knowledge — technology, science, art, — is more than a problem of pedagogical dimension; it is a problem of social policy, of risk taking, of tapping into situations that can nurture meaningful change. As Papert noted in *Mindstorms* almost two decades ago, "What is happening now is an empirical question. What can happen is a technical question, but what will happen is a political question, depending on social choices" (1980, p. 29). This is the key issue. Will technology continue to slip through the window of television, or will it become a door that opens the way to new opportunities and change?

Half a century ago, Costa Rica had a stubborn president who was a visionary. His name was Jose Figueres-Ferrer. He abolished the army and committed himself to the construction of what could have easily been interpreted, within the context of the region and the times, as an "unrealistic scenario." Because of its relation to the problems that concern us in rethinking the role of technology in education, I would like to close these remarks by quoting what he wrote in 1949, one year before he took that radical and path-breaking step:

> *First there should be a philosophy to light the way. Then come all the technical plans ... guided by a central idea and by the most noble spirit that we can snatch from our hearts. All of us know that stars cannot be reached by the hand. But we must agree that human beings, communities and nations need to know exactly the star to which they will hitch their wagon in order to be able to distinguish at crossroads along the way which paths lead forward, which are simply deviations, which will rather lead us back . . .*
>
> (Figueres, *Escritos y Discursos*, 1986)

No doubt the time has come to define precisely the star to which education will hitch the technology wagon.

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